

I claim:

1. A valve system for charging and exhausting of combustion chambers of internal combustion engines including;

(a) a cylinder head adapted for securing to a multi-level combustion chamber, the cylinder head including asymmetrical ports which open into the combustion chamber on separate levels;

5 (b) each port controlled by a valve member larger than the port, the valve member of similar shape as the port, each valve member providing a flat sealing area for contacting the port periphery;

10 (c) each valve member having a non-centered cylindrical stem operatively traveling in a cylindrical valve guide sealed by a valve guide seal, each valve stem protruding through an end of the valve guide opposite the combustion chamber to locate a valve spring and accept a follower which captures the valve spring; and

(d) each follower operatively associated with a valve operating assembly to selectively provide axial movement and rotational movement to each valve member and valve stem;

15 (e) whereby the valve operating assembly first moves the valve member a nominal distance from the port periphery to unseal the port, then rotates the valve member in one direction to open the associated port, next rotates the valve member in an opposite direction to close the associated port, and finally moves the valve member a nominal distance to contact the port periphery and seal the port.

2. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 1, wherein the valve operating assembly comprises a camshaft assembly operatively associated with each follower and valve member.

3. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 1, wherein the valve operating assembly comprises a plurality of electromechanical actuators operatively associated with each follower and valve member, one actuator providing axial movement to each valve member and valve stem, and another actuator providing rotational movement to each valve member and valve stem.

4. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 3, wherein the electromechanical actuators are solenoids.

5. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 3, wherein the electromechanical actuators are solenoid-controlled pneumatic cylinders.

6. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 2, wherein the camshaft assembly comprises a cam shaft having a cam segment associated with each follower and valve member, the cam segment including a protrusion operating on the follower to provide axial movement of the valve and valve stem, and a circumferential cam groove operating on a driven pin of the follower to provide rotational movement to the valve member and valve stem.

7. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 6, wherein the cam segment is moveably secured to the cam shaft and secured thereto with at least one setscrew.

8. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 2, wherein the ports are oriented to allow a single camshaft assembly to actuate the valve members controlling the ports.

9. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 1, wherein each valve seating area includes a seal fitted to the seating surface.

10. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 9, further including a groove in the valve seating surface to accept the seal therein.

11. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 1, wherein the follower and valve stem are mutually registered non-rotatably, and slidably fitted to each other with a locking means there between.

12. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 1, wherein the valve stem further includes a flat surface and the follower includes a set screw contacting the valve stem flat surface, thereby adjustably securing the follower to the valve stem.

13. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 1, wherein the follower includes a driven pin, having an axis a selected distance from the valve stem, for engaging the valve operating assembly.

14. A valve system for charging and exhausting of combustion chambers of internal combustion engines including;

(a) a cylinder head adapted for securing to a multi-level combustion chamber, the cylinder head including asymmetrical ports which open into the combustion chamber on separate levels;

5 (b) each port controlled by a valve member larger than the port, the valve member of similar shape as the port, each valve member providing a flat sealing area for contacting the port periphery;

10 (c) each valve member having a non-centered cylindrical stem operatively traveling in a cylindrical valve guide sealed by a valve guide seal, each valve stem protruding through an end of the valve guide opposite the combustion chamber to locate a valve spring and accept a follower which captures the valve spring; and

15 (d) each follower operatively associated with a valve operating camshaft assembly to selectively provide axial movement and rotational movement to each valve member and valve stem, the camshaft assembly including a cam shaft having a cam segment associated with each follower and valve member, the cam segment including a protrusion operating on the follower to provide axial movement of the valve member and valve stem, and a circumferential cam groove operating on a driven pin of the follower to provide rotational movement to the valve and valve stem;

20 (e) whereby the valve operating camshaft assembly first moves the valve member a nominal distance from the port periphery to unseal the port, then rotates the valve member in one direction to open the associated port, next rotates the valve member in an opposite direction to close the associated port, and finally moves the valve member a nominal distance to contact the port periphery and seal the port.

15. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 14, wherein the cam segment is moveably secured to the cam shaft and secured thereto with at least one setscrew.
16. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 14, wherein the ports are oriented to allow a single camshaft assembly to actuate the valves controlling the ports.
17. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 14, wherein the follower and valve stem are mutually registered non-rotatably, and slidably fitted to each other with a locking means there between.
18. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 14, wherein the valve stem further includes a flat surface and the follower includes a set screw contacting the valve stem flat surface, thereby adjustably securing the follower to the valve stem.
19. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 14, wherein the follower includes a driven pin, having an axis a selected distance from the valve stem, for engaging a circumferential cam groove of the valve operating assembly.

20. A valve system for charging and exhausting of combustion chambers of internal combustion engines including;

- (a) a cylinder head adapted for securing to a multi-level combustion chamber, the cylinder head including asymmetrical ports which open into the combustion chamber on separate levels;
- 5 (b) each port controlled by a valve member larger than the port, the valve member of similar shape as the port, each valve member providing a flat sealing area for contacting the port periphery;
- (c) each valve member having a non-centered cylindrical stem operatively traveling in a cylindrical valve guide sealed by a valve guide seal, each valve stem protruding through an end of the valve guide opposite the combustion chamber to locate a valve spring and accept a follower which
- 10 captures the valve spring; and
- (d) each follower operatively associated with a valve operating actuator assembly to selectively provide axial movement and rotational movement to each valve member and valve stem, the actuator assembly comprising a plurality of electromechanical actuators operatively associated with each follower and valve member, one actuator providing axial movement to each valve member and valve stem, and another actuator providing rotational movement to each valve member and valve stem;
- (e) whereby a first actuator first moves the valve member a nominal distance from the port periphery to unseal the port, then a second actuator rotates the valve member in one direction to open the associated port, next the second actuator rotates the valve member in an opposite direction to close the associated port, and finally the first actuator moves the valve member a nominal distance to contact the port periphery and seal the port.

21. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 20, wherein the electromechanical actuators are solenoids.
22. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 20, wherein the electromechanical actuators are solenoid-controlled pneumatic cylinders.
23. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 20, wherein the follower and valve stem are mutually registered non-rotatably, and slidably fitted to each other with a locking means there between.
24. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 20, wherein the valve stem further includes a flat surface and the follower includes a set screw contacting the valve stem flat surface, thereby adjustably securing the follower to the valve stem.
25. The valve system for charging and exhausting of combustion chambers of internal combustion engines of claim 20, wherein the follower includes a driven pin, having an axis a selected distance from the valve stem, for engaging the valve operating assembly.